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Integrated Wet Weather Improvement Plan

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This evening's goal is to inform you about:

1. The challenge Lakewood faces controlling overflows
2. Input from the Clean Water Lakewood Taskforce
3. Potential control measures
4. Planning-level financial estimate
5. Next steps
6. Timeline

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Our Challenge

- Lakewood collection system and treatment plant perform well during dry weather and very minor rain events
- Generally, whenever we have significant rain our sewer system overflows; discharging untreated sewage into lake and river
  - ~68 overflow locations throughout Lakewood
  - many are not directly overflowing to lake or river, but overflow to the storm sewer system and then to the lake or river
- Federal and OEPA mandate: Lakewood must control millions of gallons of sewer overflow that happen every year

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Why do we have overflows?

- ~70% of land is impervious
  - streets, sidewalks, driveways, rooftops
  - limited areas where water can infiltrate
- Many homes have gutters and foundation drains leaking into the sanitary sewer
- Storm laterals blocked with dirt and backup into the sanitary lateral
- Old, broken & cracked pipes that allow water to enter
- ~30% of our sewers were designed in the horse and buggy era and were intended to overflow into the lake
- Stormwater is unnecessarily collected and delivered to treatment plant

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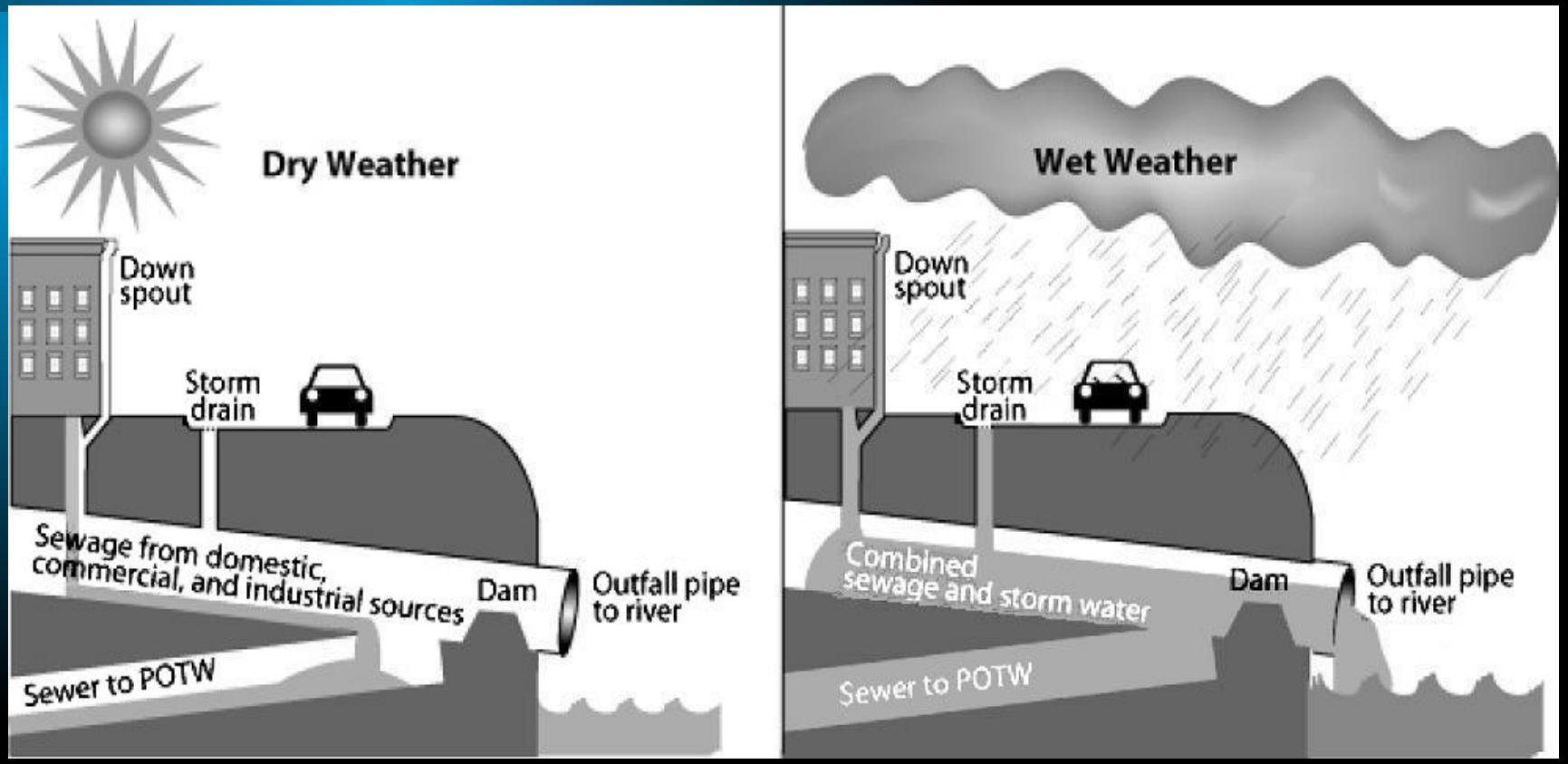
Simplified combined sewer overflow (CSO) diagram



In a typical year Lakewood discharges over 170 million gallons of sewage mixed with stormwater to Lake Erie and Rocky River.

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Lakewood's Permit

- OEPA & City establish goals on permit, such as:
  - Characterization study of sewer system
  - Integrated Wet Weather Improvement Plan (**IWWIP**)
  - Constructing an interim control measure that requires high rate treatment of wet weather flow
  - Continually monitoring all overflows
  - Eliminating cross connections within the sewer system
  - Insuring that there are no dry weather sewage discharges from the City's outfalls

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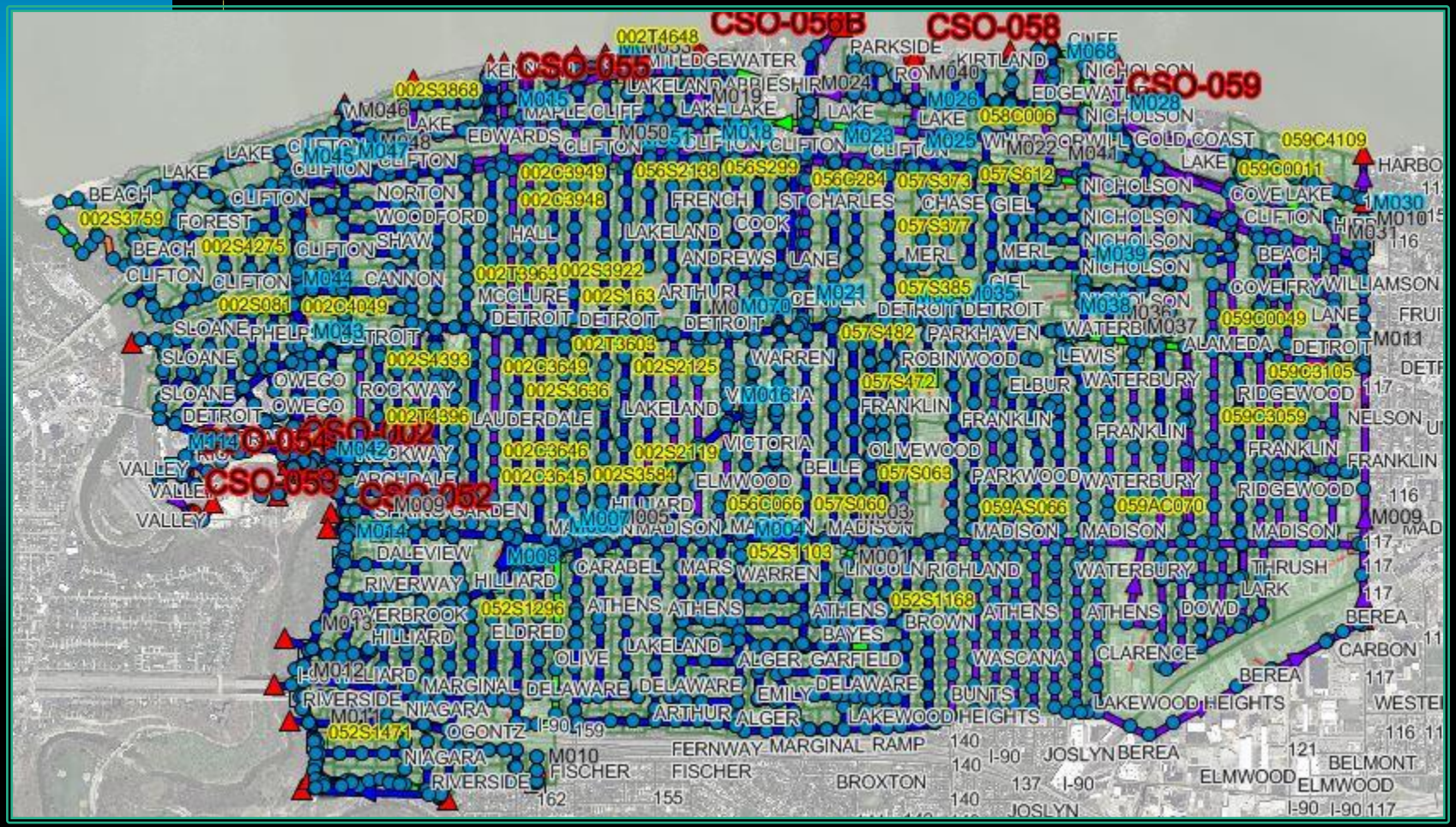
Characterization - Comprehensive calibrated computer model of the sewer system



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Integrated Wet Weather Improvement Plan (IWWIP) includes:

- A plan to eliminate or reducing overflows
- Analyzing pollutant discharges
- Engaging community
- Determining financial capability
- Performing sewer rate study

Two projects currently underway:

1. Design of high rate treatment at WWTP
2. Source control pilot study on Eldred, Atkins & Delaware

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In June of 2015 the city asked citizens to volunteer to provide public input

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Clean Water Lakewood Stats

- ~20 consistent volunteers: educated and engaged on sewer system and overflow complexities
- Met monthly July 2015-May 2016
  - 2 field trips: Watershed Stewardship Center (Parma) & Waste Water Treatment Plant (WWTP)
  - Many are interested to continue engaging with public on this issue
- Identified potential control measures, reflecting community values and priorities
- Evaluated public suggestions using the computer model and included the feasible alternatives in the IWWIP

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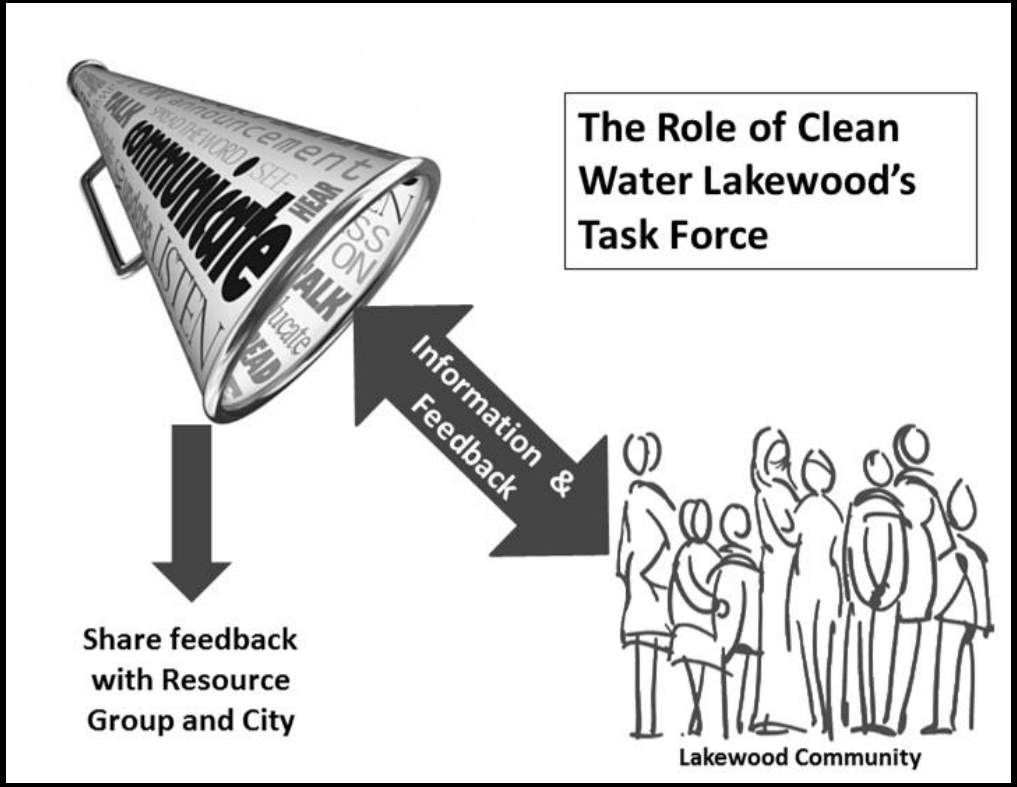
The Clean Water Lakewood Resource Binder

- Contains all handouts; a copy is in Council Office
- Website also contains all handouts: onelakewood.com/cleanwaterlakewood/



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Engagement strategies CWL task force identified

- Neighborhood competitions on reducing runoff
- Field trips to WWTP or Stewardship Center
- Create display explaining sewer issues, something 3-D perhaps in library
- Go out on lake and video when overflows occur
- Print FAQ handouts, set up table at farmer's market or local events
- Create waste and storm water flow diagrams, place in public buildings

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Control measures the CWL task force suggested include:

- Source control on public and private property*
- Green infrastructure strategically located within the right of way (ROW)*
- East end storage/diversion
- Sewer separation

Goal: meet requirements of preventing overflows in a typical year of rain

** Modeling showed these are very effective*

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CWL taskforce suggestions were modeled to determine if they were feasible and effective approaches

Name:
059A_M039_Hydrograph

Rain gage used: 1977

Hydrographs for: March (*)

Months with UH data have a (*) next to them.

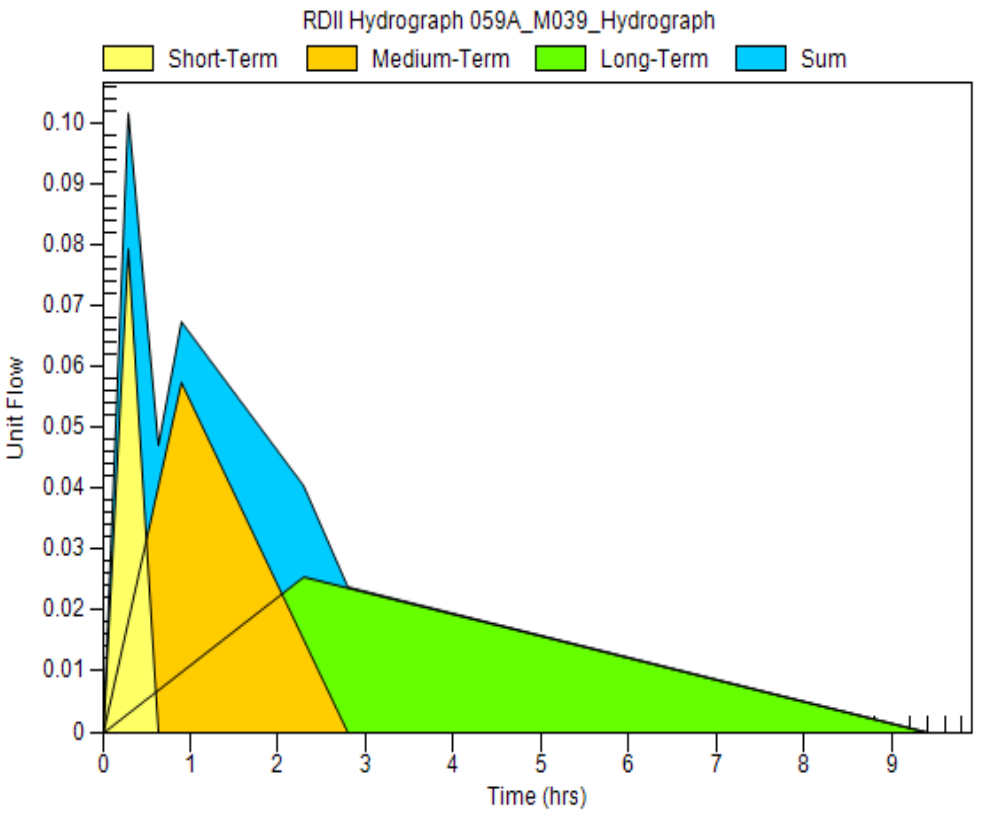
Unit Hydrographs | Initial Abstraction Depth

Response	R	T	K
Short-Term	0.025	0.3	1.1
Medium-Term	0.08	0.9	2.1
Long-Term	0.12	2.3	3.1

R = fraction of rainfall that becomes I&I

T = time to hydrograph peak (hours)

K = falling limb duration / rising limb duration



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Source Control: involves work on private & public property

- Homeowners often have both storm & sanitary connections, but:
  - Gutters and/or foundation drains are leaking into the sanitary sewer
  - Clogged storm downspouts and laterals that force water of out storm connection and into sanitary connection
  - Both of these cause rain water to enter sanitary sewer
- Old, cracked pipes allow groundwater to leach into the sanitary pipes, adding unnecessary water
- Conducted a pilot study on Eldred, Atkins, and Delaware to determine if properly connecting everyone's pipes is an effective approach to eliminating or reducing overflows

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Pilot Study, public side: Manhole separation

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Pilot Study, public side: Manhole separation

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Pilot Study, private side: Connecting downspouts to storm lateral

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Green Infrastructure

- Re-establishing natural processes to reduce runoff
- Runoff infiltrates into ground, taken up by plants, and/or evaporates
  - Bioretention and permeable pavement are the two types frequently discussed by taskforce

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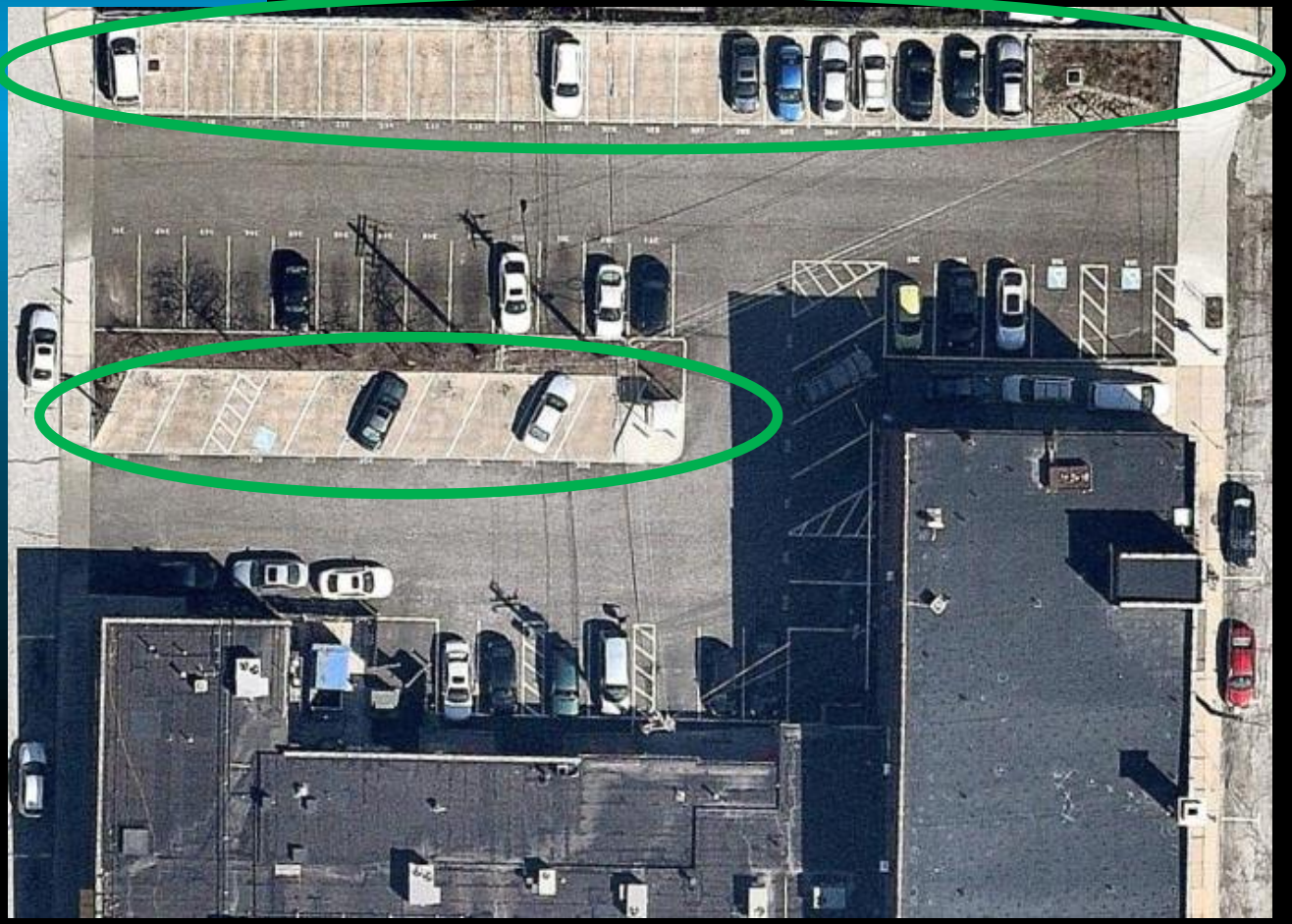
Permeable pavers in municipal lots A, B, and C



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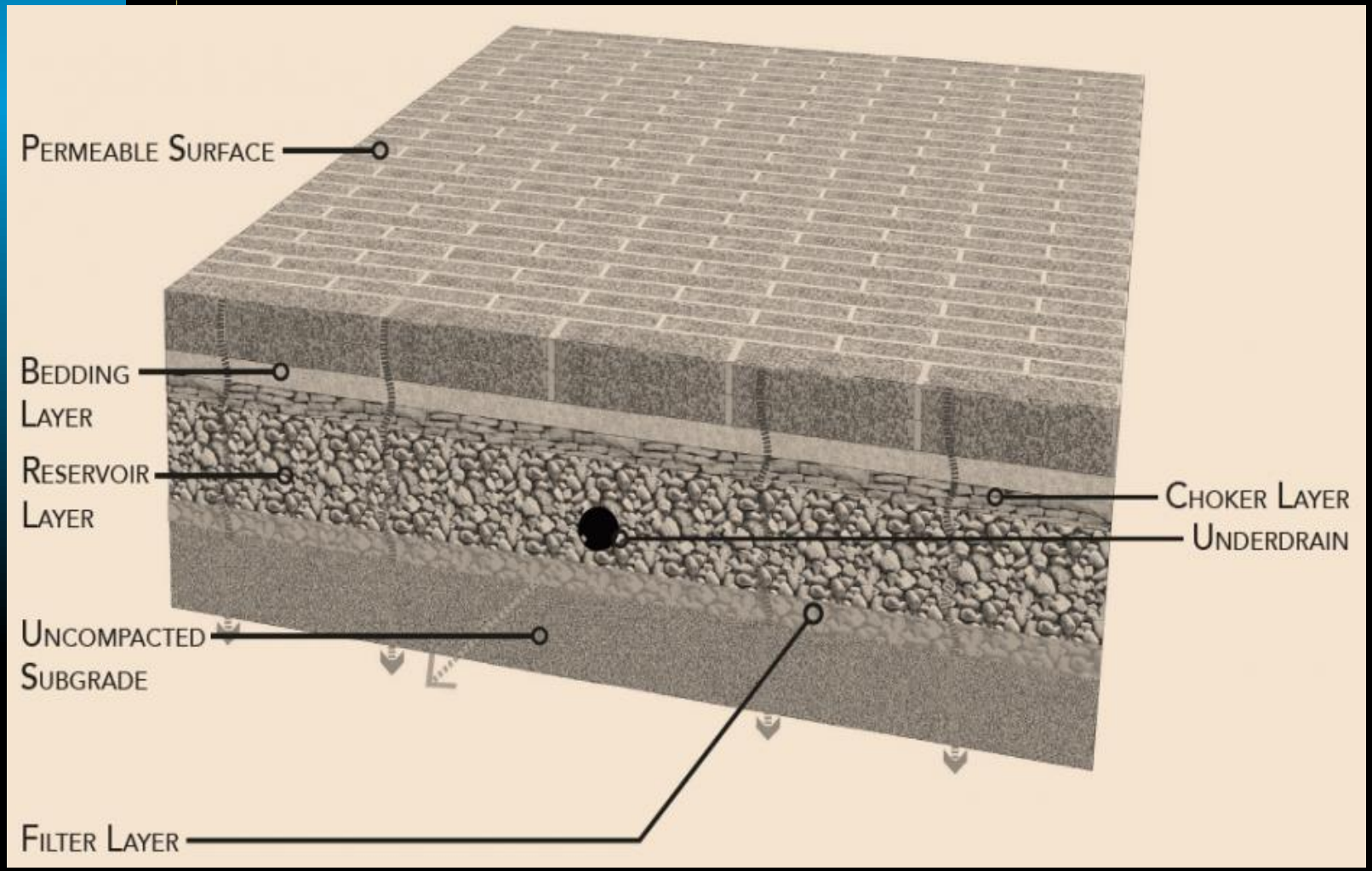
Cross-section of permeable pavement



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Bioretention at Municipal Parking Lot C

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Bioretention installed on Madison Avenue

Madison Avenue Bio-retention

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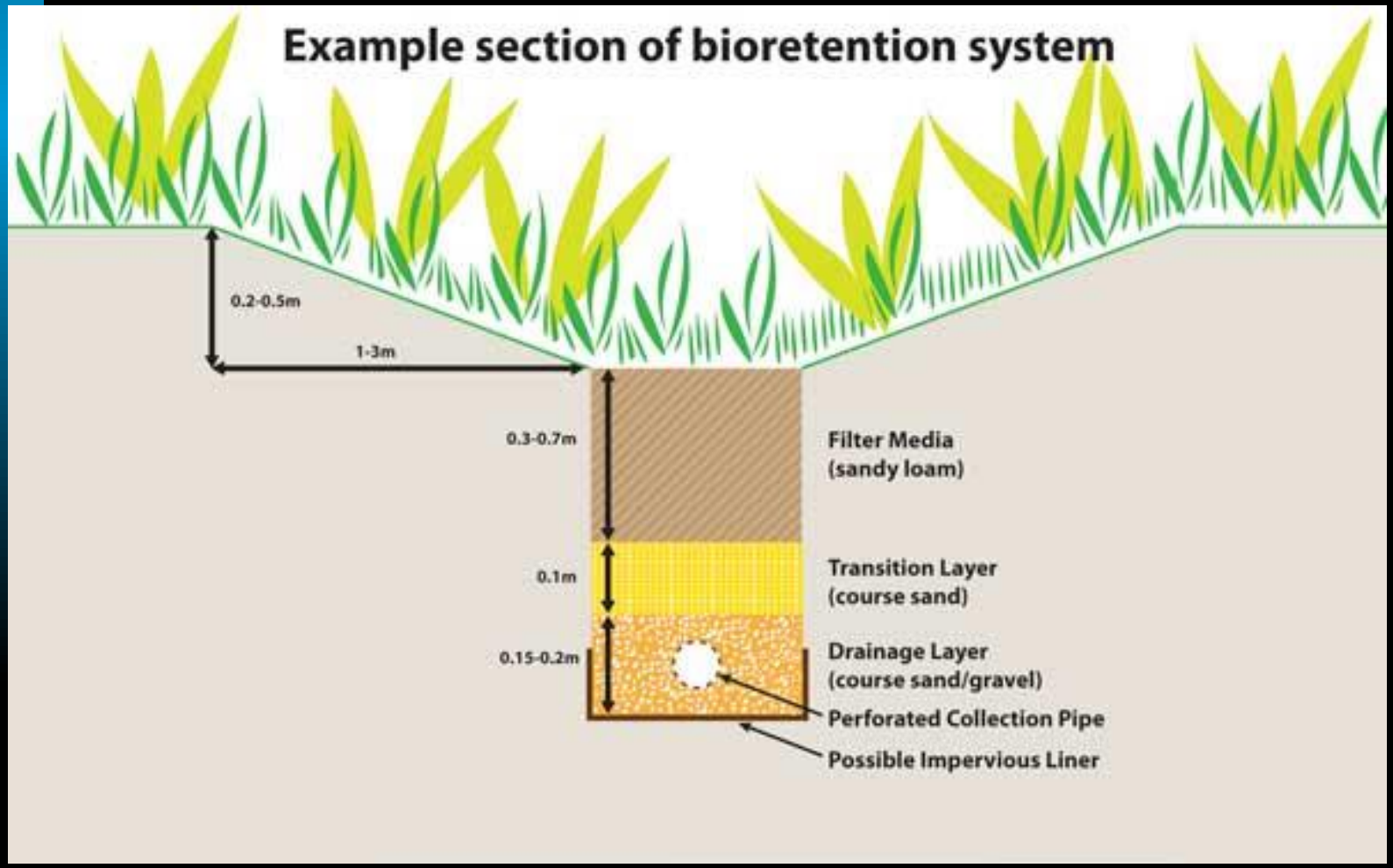
Bioretention on Madison Avenue



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Lakewood's experience with Green Infrastructure

Location	Pre-construction Volume (gal)	Post Construction Volume (gal)	Reduction
St. Charles Avenue (Parking Lot A)	18,325	0	100%
Warren Road (Parking Lots A&B)	42,404	20,467	52%
Cook Avenue (Parking Lots B&C)	971,114	43,276	96%
Gladys Avenue (Parking Lot C)	9,707	5,656	42%
Madison Avenue (at Madison Park)	17,777	3,993	78%

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Lakewood's experience with Green Infrastructure (continued)

Location	Pre-construction Rate (mgd)	Post Construction Rate (mgd)	Reduction
St. Charles Avenue (Parking Lot A)	0.314	0	100%
Warren Road (Parking Lots A&B)	1.262	0.503	60%
Cook Avenue (Parking Lots B&C)	17.410	1.751	90%
Gladys Avenue (Parking Lot C)	0.258	0.136	47%
Madison Avenue (at Madison Park)	0.429	0.082	81%

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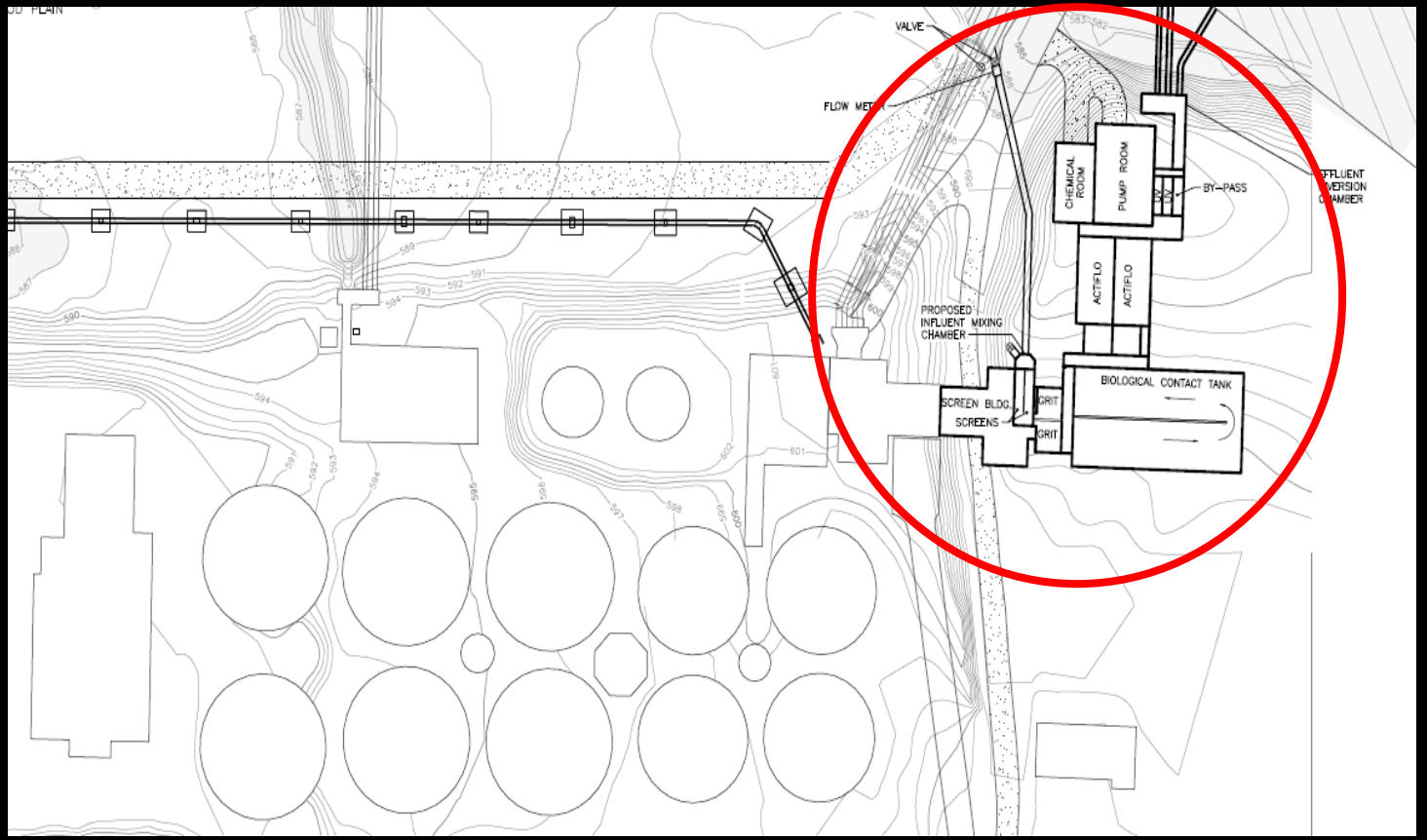
High Rate Treatment at WWTP

- Will have a treatment capacity of 35 million gallons per day
- Permanent facility is major commitment under NPDES permit



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East End Potential Options

- Combined sewer area
- Even with extensive green infrastructure, overflows would be active
- Two potential approaches identified:
  - Possibly increasing flow to NEORSD sewers along West 117th Street; or
  - Construct a high-rate treatment facility in Gold Coast neighborhood

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Areas for Sewer Separation

- Sections of the following: Edgewater, Webb, Thoreau, Clifton
- Separation has challenges similar to source control neighborhoods:
  - Could require private property work
  - Only clean water connections allowed to new sanitary

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Planning-level Financial Estimate

Control Measure	Cost Estimate ($ million)	Includes
Private-side Source Control	**60.6**	Lateral lining, sump pump, downspout redirection, properly connected homes
Public-side Source Control	**60.6**	Manhole separation, lining sewers, repairs
Green Infrastructure	**40**	Bioretention and permeable pavement
High Rate Treatment	**35**	Located at Lakewood WWTP
Miscellaneous	**10**	Separation, pump stations, storm sewers
Total (not including East End)	**206.2**	

East End Options	
Control Measure	**Cost Estimate ($ million)**
Increase East End Flow to NEORSD	**??**
15 MGal Detention Basin	**60**

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IWWIP Report to OEPA is due September 1, 2016 and is to include:

- Hydraulic characterization of Lakewood including yearly overflows
- Pollutant model
- Pilot study analysis
- Public input program
- Planning-level control strategies (source control, green infrastructure, and high rate treatment)
- Basis of design for high rate treatment
- Planning-level cost estimate

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Potential areas for Source Control and Green Infrastructure based on public input and analysis

Source Control

Green Infrastructure

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Timeline

Date	Ohio EPA Requirement
September 2014	New NPDES permit issued by OEPA
September 2016	Design specifications of High Rate Treatment (HRT) due, as well as feasible alternatives plan created
March 2018	Submit a permit to install HRT plant, and begin construction within 6 months of permit being approved
March 2019	Final IWWIP due with alternatives analysis, financial analysis, and detailed plan for dealing with overflows
September 2022	Construction of HRT is complete and reducing overflows at plant